ARPA-E Wind and Solar Forecasting Workshop

Agenda and Goals for the Day

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ARPA-E

March 30, 2012

Thank You!

ARPA-E's work would not be possible without people like you volunteering their time

Apologies!

For the tight environment. We have had overwhelming response for this workshop.

Apologies!

We will have to play musical chairs (rearrange from classroom to U shape) 3 times, so please get all your belongings and go into hallway:

- At the beginning of the coffee break (9:20 AM)
- At the beginning of Lunch (11:45 AM)
- At the beginning of session 3 (1:15 PM)

Why are we here?

Table 2

Average Wind Forecast Error by Time Frame

	Forecast Error	
	Single Plant	**Region**
Hour Ahead		
Energy (% Actual)	10 – 15%	6 – 11%
Capacity (% Rated)	4 – 6%	3 – 6%
Day Ahead		
Hourly Energy (% Actual)	25 – 30%	15 – 18%
Hourly Capacity (% Rated)	10 – 12%	6 – 8%

Source: Smith, 2009.

Why are we here?

The Value of Wind Power Forecasting

Preprint

Debra Lew and Michael Milligan
National Renewable Energy Laboratory

Gary Jordan and Richard Piwko
GE Energy

	10% Forecasting Improvement	20% Forecasting Improvement
14 % Wind Penetration	$140 M	$260 M
24% Wind Penetration	$500 M	$975 M

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ARPA-E's RE Integration Efforts So Far:

GENI:Green Electricity Network Integration

GRIDS:Grid Rampable Intermittent Dispatchable Storage

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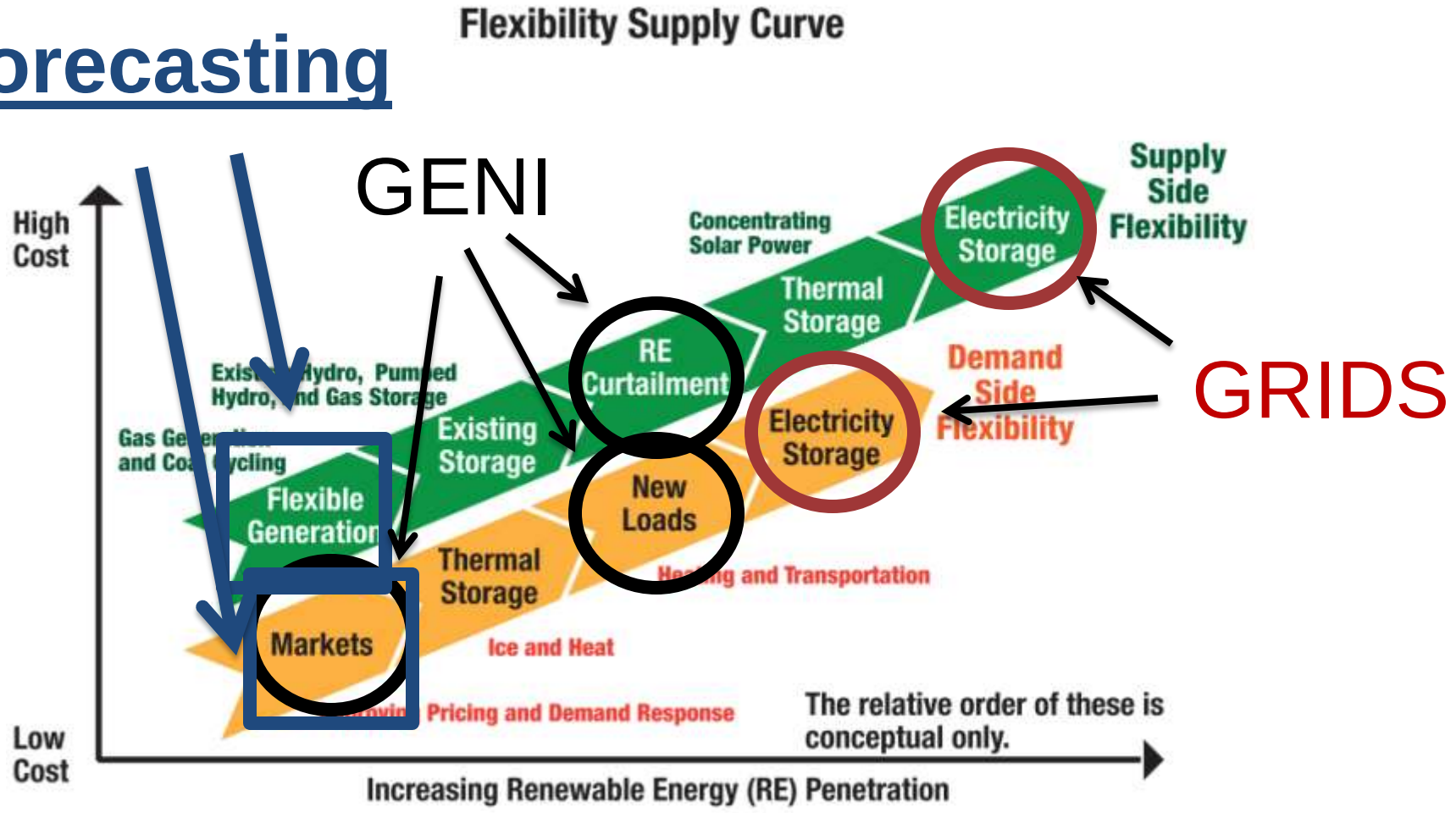
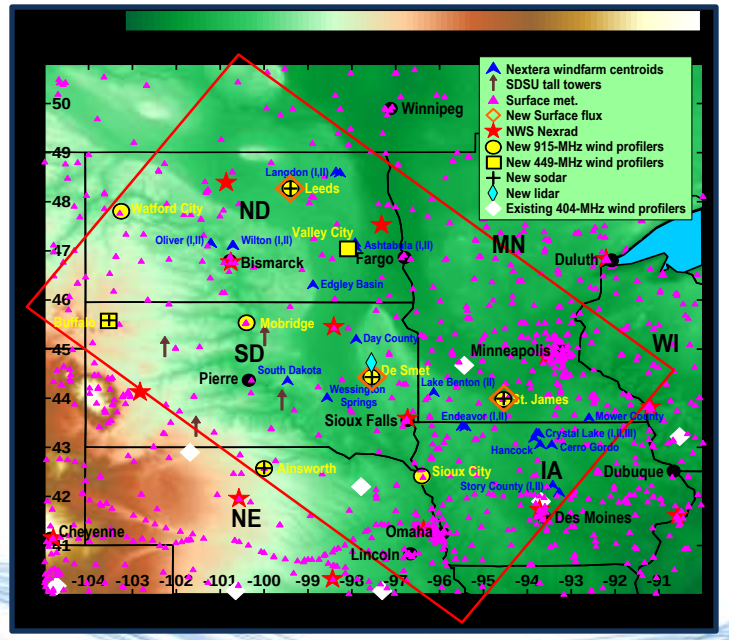
Forecasting to Improve Prospects for Low Cost RE Integration Enablers

Forecasting



Three Tech Directions (or more) for the Day

1.More data, more sensors and what do you need to (data an analytics) to support it



Three Tech Directions (or more) for the Day

2. Computational resources to improve model resolution with or without more data.

Ken Birman

Sue Ellen Haupt

Three Tech Directions (or more) for the Day

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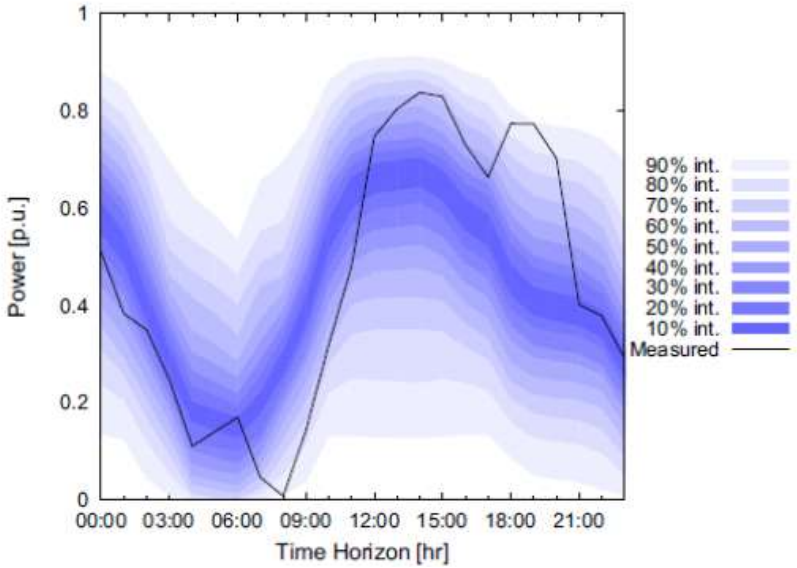
Three Tech Directions (or more) for the Day

3. Dynamically moving sensors to get data where it is most needed.

Quantile/interval forecast for one day:



Three Tech Directions (or more) for the Day

Or More: From you!

What is our goal?

Answer: To justify a possible research program.

We do this in a two step process:

1. If it works, would it matter?

2. Is there anything that could possibly work?

1. If it works, would it matter?

This is the question we are addressing in the morning sessions

Trying to get to a Techno Economic Goal

Such as the BEEST Targets:

400 Wh/kg

$300/kWh

2.Is there anything that could possibly work?

This is the question we are addressing in the afternoon sessions

When looking at the technologies we ask:

- **Can they reach the techno-economic target?**
- **Are they unlikely to do it without ARPA-E funding?**

Breakout Sessions

Booz Allen Room

Dr. Nicholas Cizek

Techno Economic Goals

Improved Sensors

Hamilton Room

Dr. Tim Heidel

Techno Economic Goals

Computational Resources, Challenges and Sensor Placement Optimization

A thank you to our morning speakers

Stan Calvert
DOE Wind & Water Program

Kevin Lynn
DOE Solar/SunShot Program

Jim Wilczak
NOAA

Justin Sharp
Sharply Focused Forecasting

A thank you to our afternoon speakers

Ken Birman
Cornell University

Niels LaWhite
Second Wind

Mike Margulis
Lockheed Martin

Vijay Kumar
University of Pennsylvania

A Plea to Our Speakers: Please Watch the Time!

We have a lot to get through. There will be plenty of time to elaborate in breakouts

This is Booz Allen. Hamilton is next door.

If you are not assigned to a breakout session see me at the break at 9:30

We have a great group here:
Chance to network during break, lunch and at Neighborhood bar at 3:30 PM